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TRANSMITTAL LETTER
(General - Patent Pending)

Docket No.
4488

Re Application Of: **Chen et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
09/804,328	March 12, 2001	Edward M. Johnson	48226	1754	

Title:

COMMISSIONER FOR PATENTS:

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Resubmission of Appeal Brief in response to Notification of Non-Compliant Appeal Brief

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Dated: September 19, 2006

Signature

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Chen et al.	Group Art Unit: 1754
Serial No.: 09/804,328	Examiner: Edward M. Johnson
Filed: March 12, 2001	
Title: <i>Selective Catalytic Reduction of N₂O</i>	Atty. Docket No. 4488

5 Commissioner of Patents
and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

10 APPEAL BRIEF

Real Party Of Interest

The real party of interest in this case is BASF Catalysts LLC.

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Related Appeals And Interferences

There are no appeals or interferences known to be related to or have a bearing on the Board's decision in the pending appeal.

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Status Of Claims

Claims 3, 5-7, 10-14 and 18 are pending and have been Finally Rejected. These Finally Rejected claims form the basis of this appeal. Claims 1, 2, 4, 8, 9, 15-17, and 19-25 24 have been canceled.

Status Of Amendments

5 A response to the Final Rejection under 37 CFR 1.116 without amendment was
filed on January 31, 2006. By advisory action dated February 13, 2006, the request for
reconsideration was considered but did not place the application in condition for
allowance.

10 An Amendment under 37 C.F.R. 1.116 was filed on August 22, 2006 correcting a
typographical error noted by the Examiner in the Notification of Non-Compliant Appeal
Brief dated August 4, 2006. The Amendment was entered for purpose of appeal, on
September 1, 2006.

Summary Of Claimed Subject Matter

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The presently claimed invention as set forth in sole independent claim 18 is
directed to the selective catalytic reduction of NO_x to achieve simultaneous removal of
NO_x and N₂O from a single process stream, page 6, lines 26-29. The inventive
simultaneous removal of NO_x and N₂O in a single process stream is achieved by
20 introducing ammonia into the process stream upstream of a catalyst bed, page 7, lines 1-
2. In accordance with this invention, the gas stream containing both NO_x and N₂O is
passed in contact with a beta zeolite, page 7, lines 4-9. The gas stream has a temperature
over 250°C, page 6, lines 1-2.

25 Page 11, line 25 through page 12, line 4 discusses that the zeolite beta catalyst
was unable to provide NO_x conversion in a gas containing both NO_x and N₂O without
the addition of ammonia (Figure 7), but by introducing ammonia into the gas stream
containing both NO_x and N₂O, conversions of both these nitrogen compounds over
zeolite beta were increased substantially.

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Ground Of Rejection To Be Reviewed On Appeal

1. Claims 3, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a) as
5 being unpatentable over Riley et al. (US 5,200,162) in view of Fetzer (US 6,056,928).
The Examiner states that Riley discloses a process for nitrous oxide decomposition
comprising contacting a nitrous oxide and NO_x stream with ammonia and zeolite. The
Examiner recognizes that Riley fails to disclose beta zeolite for the simultaneous
10 reduction of the nitrogen compounds. The Examiner applies Fetzer as disclosing a beta
zeolite and concludes it would have been obvious to one of ordinary skill in the art at the
time the invention was made to use the beta zeolite of Fetzer selective for simultaneous
reduction in the process of Riley. The Examiner also states that Riley discloses a
temperature of reaction of 150-550 °C and discloses iron-exchanged zeolites.

15 2. Claims 3, 5-7, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a)
as being unpatentable over Kato et al. (US 4,571,329) in view of Fetzer as mentioned
above. The Examiner applies Kato as disclosing a process for ammonia reduction of
nitrous oxide comprising contacting a nitrous oxide containing gas with ammonia and
zeolite and discloses removal of NO_x and N₂O. The Examiner admits that Kato fails to
20 disclose beta zeolite selective for the simultaneous reduction of the nitrogen compounds.
Fetzer is applied as previously as disclosing a beta zeolite. The Examiner concludes it
would have been obvious to one of ordinary skill in the art at the time the invention was
made to use the beta zeolite of Fetzer in the nitrous oxide decomposition process of Kato.
The Examiner states that Kato discloses a temperature of reaction of 300-500 °C and an
25 iron-exchanged zeolite.

3. Claims 3, 10-11, and 18 have been Finally Rejected under 35 USC 103 (a) as
being unpatentable over Tsuchitani et al. (US 5,756,057) in view of Fetzer as mentioned
above. The Examiner states that Tsuchitani discloses a method for removal of NO_x
30 comprising contacting a stream containing N₂O with a reducing agent such as ammonia

and a catalyst comprising a zeolite. The Examiner admits that Tsuchitani fails to disclose beta zeolite. Fetzer is applied as previously as disclosing a beta zeolite. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the beta zeolite of Fetzer in the nitrous oxide decomposition process of Tsuchitani et al.

Argument

1. *Claims 3, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a) as being unpatentable over Riley et al. (US 5,200,162) in view of Fetzer (US 6,056,928).*

With respect to the rejection based on the combination of Riley in view of Fetzer, it is Appellants position that the applied references in combination do not suggest or render obvious the claimed process and in particular, do not suggest that a beta zeolite could be effective for the simultaneous reduction of N₂O and NO_x in a gas stream further containing ammonia.

First, Riley is concerned with the decomposition of N₂O in a gas stream and not the simultaneous decomposition of N₂O and NO_x. In fact, the Abstract of Riley states that when the N₂O containing gas stream also contains NO_x, it is “often highly desirable to pretreat the stream to remove NO_x prior to the N₂O-decomposition zone.” Further, column 3, lines 45-50 of Riley states that when the gas stream contains other oxides of nitrogens such as NO_x, the process “may need to be modified to remove NO_x prior to the N₂O decomposition zone.”

In Riley, the N₂O-containing feedstock is passed into a decomposition zone containing a solid catalyst. The solid catalyst can be a variety of materials including zeolites, column 4, lines 34-39. The types of zeolites are disclosed at column 5, lines 5-24. Zeolite beta is not disclosed. In column 8, lines 25-59, Riley discloses the need to remove NO_x prior to his process of decomposing N₂O. Riley states in the mentioned

passage that “the effectiveness of many catalyst for N₂O decomposition is significantly impaired by NO_x.” In the same mentioned passage, Riley states “the presence of NO_x in the N₂O-containing feed gas is detrimental. In these cases it is highly desirable to remove NO_x in a zone prior to the N₂O decomposition zone.” Riley then discloses methods which can remove the NO_x prior to the decomposition of the N₂O stream including the selective reduction of NO_x with ammonia in the presence of oxygen and catalyzed by precious metals. Clearly, Riley does not teach nor suggest the use of any catalyst which is selective for the “simultaneous reduction of N₂O and NO_x” as claimed let alone the use of beta zeolite.

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The secondary reference to Fetzer is directed to a multistage process for removing nitrogen oxides from a gas stream. Fetzer neither discloses simultaneous removal of N₂O and NO_x from a gas stream nor suggest that zeolite beta can be used to catalyze the ammonia-mediated reduction of these nitrogen oxides. Fetzer discloses a three-stage process. In Stage A adsorption of nitrogen oxides other than N₂O is achieved such as by the use of water, column 2, lines 43-48. In Stage B, the amount of N₂O is reduced by the use of a heterogeneous catalyst. Among examples of catalysts used is zeolite beta, column 4, line 15. The zeolite catalyst may be exchanged with various metals, column 4, lines 20-21. In a preferred embodiment, a Stage C is used in which the gas stream from Stages A and B can be passed through Stage C for reducing nitrogen oxides other than N₂O. In Stage C the gas stream can be reacted by means of selective catalytic reduction (SCR) in which the nitrogen oxides are reacted with ammonia. The catalysts for the SCR reaction are set forth at column 4, lines 47-57. Zeolite beta is not disclosed for Stage C.

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Accordingly, the secondary reference does not teach the simultaneous reduction of N₂O and NO_x. The secondary reference does not suggest use of zeolite beta in a reaction with ammonia. At best, Fetzer discloses in Stage B the use of beta zeolite for reducing the amount of N₂O in the absence of ammonia. Thus, it is Appellant’s position that even the substitution of beta zeolite in the process of Riley does not meet the claimed process which is directed to the simultaneous reduction of N₂O and NO_x. Riley

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separately converts NO_x and N₂O. The patent recites that it is highly desirable to remove NO_x prior to the N₂O decomposition zone. Fetzer does not make up for this deficiency of Riley. Moreover, Fetzer does not suggest that beta zeolite can be used to reduce either N₂O or NO_x in the presence of ammonia. In fact, Fetzer uses beta zeolite without ammonia. Accordingly, the combination of Riley with Fetzer does not suggest the effective simultaneous reduction of N₂O and NO_x with ammonia using zeolite beta.

The Examiner in maintaining the rejection of Riley in view of Fetzer has stated that the applicant's arguments are not persuasive because it would have been within the purview of an ordinary artisan not to add a step of removing catalyst between Stages B and C of Fetzer since no such step is disclosed. These arguments are not at all understood. There is no physical reason why the catalyst of Fetzer would be transferred from Stage B to Stage C. The Fetzer process involves a gas stream which flows through the bed of catalyst. The catalyst remains in the bed while the gas stream would then be directed to an additional stage. Accordingly, there would be no beta zeolite from Stage B of Fetzer introduced into Stage C. It is the gas stream which would be directed from Stage B to Stage C, not the catalyst. Again, Fetzer merely discloses the use of beta zeolite for reducing N₂O in the absence of ammonia. The combination of Riley and Fetzer does not remotely suggest the process of the claimed invention in which both N₂O and NO_x are simultaneously reduced in the presence of beta zeolite and ammonia.

2. Claims 3, 5-7, 10-14 and 18 have been Finally Rejected under 35 USC 103 (a) as being unpatentable over Kato et al. (US 4,571,329) in view of Fetzer as mentioned above. It is further Appellant's position that the rejection based on the combination of Kato et al. in view of Fetzer is not proper. Kato discloses in column 5, lines 18-56, the ammonia reduction of NO₂ employing a reactor having filled a large amount of catalyst which is active to both the reaction of NO₂ with ammonia and the ammonia reduction reaction of N₂O. The reaction takes place in the presence of a zeolite catalyst such as an H or Fe substituted zeolite catalyst such as mordenite, zeolite Y, and the other zeolites disclosed in column 4, lines 43-49. Zeolite beta is not disclosed.

It is believed that the Examiner's reliance upon Fetzer as discussed above to disclose the use of beta zeolite for the reaction in Kato is improper. As stated above, Fetzer is not concerned with the ammonia reduction of N_2O in the presence of beta zeolite. It is the Appellants who have discovered that zeolite beta can be effectively used for the simultaneous reduction of NO_x and N_2O with ammonia. Neither Kato et al. which does not disclose zeolite beta nor Fetzer which discloses zeolite beta but not in a reaction which involves ammonia suggest or render obvious what Appellants have found. The Board is kindly invited to Figure 8 of the present application and the discussion thereof on page 11, line 25 through page 12, line 4. The results as disclosed therein are not suggested by the combination of references.

3. Claims 3, 10-11, and 18 have been Finally Rejected under 35 USC 103 (a) as being unpatentable over Tsuchitani et al. (US 5,756,057) in view of Fetzer as mentioned above. It is believed that the rejection based on the combination of Tsuchitani et al. in view of Fetzer is improper. Appellants point out that Tsuchitani et al. is not concerned with the simultaneous reduction of NO_x and N_2O . Tsuchitani discloses a first step of oxidizing nitrogen oxides such as NO , N_2O , etc. which are present at high proportions in the NO_x components of an exhaust gas into NO_2 . The NO_2 thus resulting from the oxidation step is then adsorbed on a component possessing NO_2 adsorbing ability. By introducing a reducing substance such as ammonia instantaneously into the exhaust gas enveloping the NO_x accumulated on the adsorbent component, the adsorbed NO_x is reduced or decomposed, column 4, lines 32-46. Thus, it is uncertain whether the gas which is treated with ammonia in Tsuchitani contains N_2O since it is the purpose of the reference to initially convert NO or N_2O , etc. to NO_2 . The only disclosure of a zeolite used in the primary reference appears to be Example 21 where ZSM-5 is utilized. However, the primary reference does not suggest simultaneous reduction of NO_x and N_2O with ammonia as set forth in the claims. Accordingly, even if Fetzer were combinable with the primary reference, the combination would not teach or render obvious the claimed process. Again, as stated above, Fetzer is not concerned with the use

of beta zeolite to reduce N_2O in the presence of ammonia. It is the Appellants who have found that zeolite beta is particularly useful for the simultaneous reduction of NO_x and N_2O with ammonia.

5 It is respectfully requested that the Final Rejection of claims 3, 5-7, 10-14, and 18
be reversed.

10 Date 9/19/2006

Respectfully Submitted,



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EVIDENCE APPENDIX

No evidence submitted.



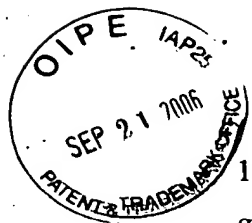
RELATED PROCEEDINGS APPENDIX

Not applicable.



CLAIMS APPENDIX

- 5 3. A method as recited in claim 18, wherein the gas stream has a temperature of from about 350°C to about 600°C.
5. A method as recited in claim 18, wherein the ammonia/N₂O concentration ratio is up to about 2.0 based on the total volume of the gas stream.
- 10 6. A method as recited in claim 18, wherein the ammonia/N₂O concentration ratio is at least about 0.5 based on the total volume of the gas stream.
7. A method as recited in claim 18, wherein the ammonia/N₂O concentration ratio is from about 0.8 to about 1.0 based on the total volume of the gas stream.
- 15 10. A method as recited in claim 18, wherein the zeolite is ion-exchanged with at least one type of ion selected from the group consisting of Fe, Cu, Co, Ce, Pt, Rh, Pd, Ir, Mg and combinations thereof.
- 20 11. A method as recited in claim 18, wherein the zeolite is ion-exchanged with at least one type of ion selected from the group consisting of Fe, Ce, Cu, Co and combinations thereof.
- 25 12. A method as recited in claim 18, wherein the N₂O concentration of the gas stream is about 1% or less.
13. A method as recited in claim 18, wherein the N₂O concentration of the gas stream is about 5,000 ppm or less.
- 30 14. A method as recited in claim 18, wherein the N₂O concentration of the gas stream is between about 20 ppm and about 5,000 ppm.



18. A method for ammonia-mediated N_2O and NO_x reduction, comprising contacting a gas stream containing N_2O and NO_x with ammonia and a catalyst comprising a BETA zeolite which is selective for the simultaneous reduction of N_2O and NO_x , wherein the gas stream containing ammonia, nitrous oxide and NO_x and has a temperature of greater

5 than about $250^{\circ}C$.